CompactFlash Disk, Flash Disk, and Flash Memory Card Information

Product Numbers: MEM-I/O-FLC16M=, MEM-I/O-FLC20M=, MEM-I/O-FLD48M=, MEM-I/O-FLD64M=, MEM-I/O-FLD128M=, MEM-7100-FLD48M=, MEM-7100-FLD128M=, MEM-NPE-G1-FLD64=, MEM-NPE-G1-FLD128=, MEM-NPE-G1-FLD256=, MEM-NPE-G2-FLD256=

This chapter describes the CompactFlash Disk, Flash Disk, and Flash Memory card options and specifications, as well as information regarding installation, reformatting, and copying bootable images. The following topics are covered in this chapter:

- Product Description, page 1-1
- Boot Environment Variables, page 1-3
- Installing and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card, page 1-4
- Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card, page 1-7
- Copying a Bootable Image onto a CompactFlash Disk, Flash Disk, or Flash Memory Card, page 1-9
- Copying Bootable Images Between Flash Disks or Flash Memory Cards, page 1-10
- Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card, page 1-11

Product Description

The CompactFlash Disk slots on the NPE-G1 and NPE-G2 network processing engines for the Cisco 7200 VXR routers, and the PC card slots on the I/O controllers and used with Cisco 7200 series routers, use three types of Flash memory options. The PC card slots on the I/O controllers and CompactFlash Disk slots on the NPE-G1 and Cisco uBR7200 series universal broadband routers also use three types of Flash Memory options. These options as follows:

- CompactFlash Disks. CompactFlash Disks are smaller in size than Flash Disks but provide the same ATA interface and equivalent functionality.

Note Use the CompactFlash Disk only with the NPE-G1 or NPE-G2 or UBR7200-NPE-G1. Do not attempt to use a CompactFlash Disk in the Type 2 Flash Disk slots in an I/O controller.

- Flash Disks, also known as Flash Memory Disks. Flash Disks are Flash memory-based devices that conform to the PC card standard (formerly called Personal Computer Memory Card International Association or PCMCIA) and present an ATA (AT Attachment) interface to the system. This interface complies with the ANSI ATA Interface Document X3T13.1153 D Rev. 9 specification. These cards provide from 48 MB to 256 MB of storage space.

  The Flash Disk is more flexible than linear Flash memory because the Flash Disk has controller circuitry that allows it to emulate a hard disk and automatically maps out bad blocks and performs automatic block erasure. The Flash Disk also provides the capability to allocate noncontiguous sectors, which eliminates the need for the **squeeze** command (which is required with linear Flash memory cards to recover the space used by deleted files).

  The Flash Disk also supports the Cisco IOS File System feature, which provides a single interface to all of the router's file systems, including the Flash Disks and onboard Flash memory, as well as network file systems such as File Transfer Protocol (FTP) and Trivial FTP (TFTP) servers.

  Note The Flash Disk is only supported on systems with the Cisco IOS File System feature, and the Cisco IOS File System feature is supported in Cisco IOS Release 12.0(1) or later releases of 12.0. In general, Flash Disk functionality requires Cisco IOS Release 12.0(2) or a later release of 12.0.

- Linear Flash Disks, also known as PC cards, were the initial PC card used for the routers and are available in 16 MB and 20 MB sizes.

Table 1-1 lists the CompactFlash Disk options and supported processors. Table 1-2 lists the Flash Disk options and supported I/O controllers. Table 1-3 lists the PC card options and supported I/O controllers.

Table 1-1 CompactFlash Disk Options

Memory Size	Product Number	Supported Processors
64 MB	MEM-NPE-G1-FLD64[1]	NPE-G1, UBR7200-NPE-G1
128 MB	MEM-NPE-G1-FLD128[1]	NPE-G1, UBR7200-NPE-G1
256 MB	MEM-NPE-G1-FLD256[1]	NPE-G1, UBR7200-NPE-G1
256 MB	MEM-NPE-G2-FLD256	NPE-G2

1. These products are also available as CompactFlash Disk upgrades. To order an upgrade, add an equal sign (=) after the Product Number, for example, MEM-NPE-G1-FLD64=.

Table 1-2 Flash Disk Options

Memory Size	Product Number	Supported I/O Controllers
64 MB	MEM-I/O-FLD64M[1]	C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII, C7200-I/O-2FE/E, C7200-I/O-GE-E+, UBR7200-I/O, UBR7200-I/O/FE, UBR7200-I/O-2FE/E
128 MB	MEM-I/O-FLD128M, MEM-7100-FLD128M[1]	C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII, C7200-I/O-2FE/E, C7200-I/O-GE-E+, UBR7200-I/O, UBR7200-I/O/FE, UBR7200-I/O-2FE/E

1. These products are also available as Flash Disk upgrades. To order an upgrade, add an equal sign (=) after the Product Number, for example, MEM-I/O-FLD64M=.

Table 1-3 PC Card Options[1]

Memory Size	Product Number	Supported I/O Controllers
16 MB	MEM-I/O-FLC16M	C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII, UBR7200-I/O, UBR7200-I/O/FE
20 MB	MEM-I/O-FLC20M	C7200-I/O, C7200-I/O-FE, C7200-I/O-FE-MII, UBR7200-I/O, UBR7200-I/O/FE

1. All linear PC card memory options have reached End-of-Life and are no longer orderable, but they can continue to be used in existing legacy installations.

Note A complete discussion of the Cisco IOS File System feature is beyond the scope of this publication. For information about this feature, refer to the *Configuration Fundamentals Configuration Guide* and *Configuration Fundamentals Command Reference* publications for Cisco IOS Release 12.*x*. These publications are available on the Documentation DVD and on Cisco.com.

Boot Environment Variables

By default, and as a result of a reset or power on, the ROM monitor loads the boot image from boot flash memory. If the ROM monitor cannot find a bootable image in boot flash memory, it searches the CompactFlash Disk or PC card-based devices (such as linear Flash memory cards or Flash Disks) for the first bootable image.

The boot image, when loaded, looks in the boot environment variables—stored in nonvolatile random-access memory (NVRAM)—to determine the location of the Cisco IOS software image and the configuration to use. If boot environment variables are not defined, the system will boot the first image found on a Flash Disk, or if no such image is found, the system will boot the first image found on a linear Flash memory card.

The contents of the boot environment variables, which are stored in the configuration file in NVRAM, determine the actions your system takes on bootup. To see the current settings of these variables, use the **show bootvar** command as follows:

```
Router> show bootvar
BOOT variable =
CONFIG_FILE variable =
Current CONFIG_FILE variable =
BOOTLDR variable does not exist
Configuration register is 0x100
```

Following are explanations for each of these boot environment variables:

- BOOT variable—Points to the Cisco IOS software image that you want to boot; you set it in configuration mode. The default software image is the CISCO*xxx* image (where *xxx* is a filename assigned by the system, if you do not enter a specific filename). The system then looks for the first image on the Flash Disk in slot 0.

Enter configuration mode and specify a filename and PC card slot from which to boot using the **configure terminal** and **boot system** commands as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot system flash disk0:c7200-p-mz.12-0
```

The result of this configuration file entry is that the BOOT variable is disk0:c7200-p-mz.12-0.

- CONFIG_FILE (configuration file) variable—Determines where the configuration is read from on bootup; you set it in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot config disk0:configfile
```

The result of this configuration file entry is that the CONFIG_FILE variable is disk0:configfile.

- BOOTLDR (boot loader) variable—Determines which image is used as the boot helper (boot image); you set it in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot bootldr bootflash:c7200-boot-mz
```

The result of this configuration file entry is that the BOOTLDR variable is bootflash:c7200-boot-mz.

- Configuration register variable—Instructs the system where to look for a bootable Cisco IOS software image; you set it as a hexadecimal value in configuration mode as follows:

```
Router# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# config-register 0x102
```

The result of this configuration file entry is that the configuration register is set to hexadecimal 0x102. For more information about the configuration register, see Chapter 4, "Observing System Startup and Performing a Basic Configuration," in the *Cisco 7200 VXR Installation and Configuration Guide* at the following URL:

http://www.cisco.com/en/US/products/hw/routers/ps341/products_installation_guide_book09186a008007daa6.html.

Installing and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card

This section describes the proper method for installing and removing a CompactFlash Disk, Flash Disk, or Flash memory card into the CompactFlash Disk slots on an NPE-G1 or NPE-G2, or the Flask Disk or PC card slots on an I/O controller.

Tip All CompactFlash Disks, Flash Disks, and Flash memory cards must be formatted before their initial use. CompactFlash Disks, Flash Disks, or Flash memory cards shipped with an I/O controller, NPE-G1, or NPE-G2, are formatted at the factory, but spare memory cards are not formatted. To avoid potential problems when using spare memory cards, we recommend that you reformat all of your memory cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the "Software and Hardware Requirements" section on page 3-2.)

See the "Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card" section on page 1-7 for instructions on how to reformat a memory card.

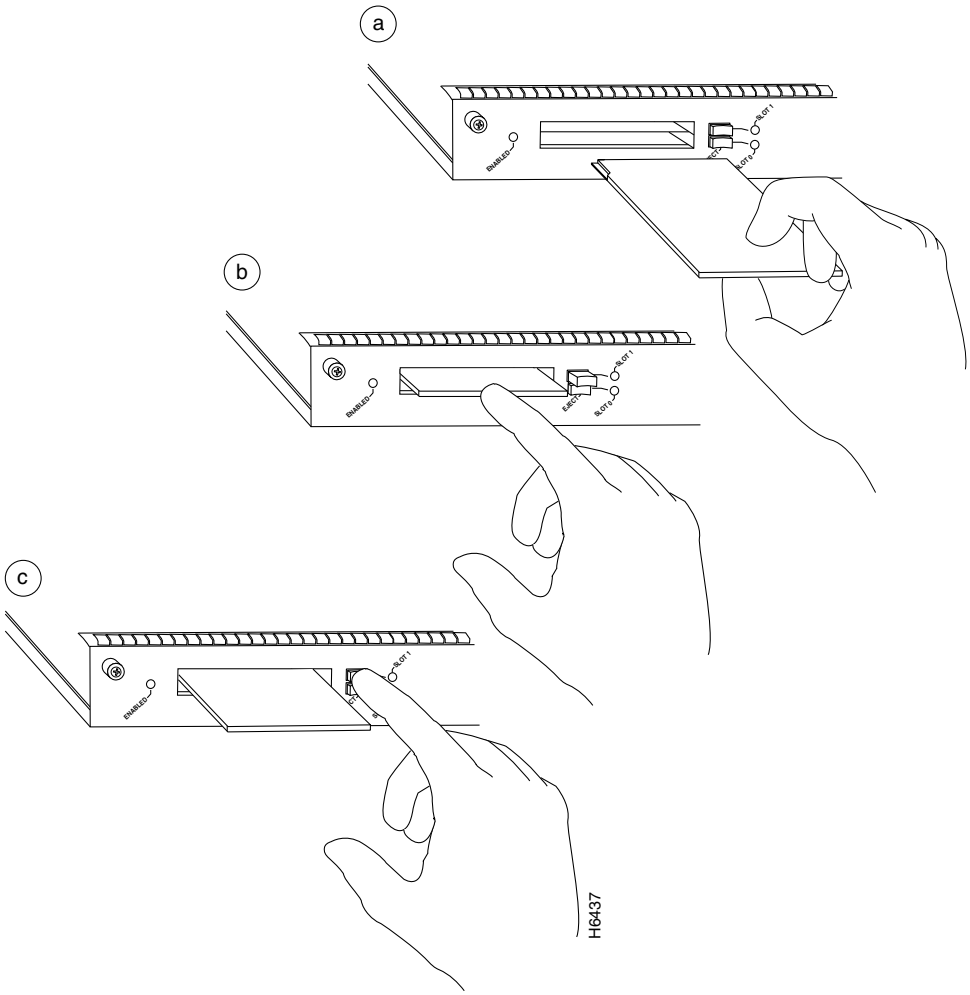
Note For safety warnings for the memory cards, see the "Safety Guidelines" section on page 3-8.

An I/O controller has two physical PC card slots: slot 0 (lower) and slot 1 (upper). (See Figure 1-1.) The NPE-G1 and NPE-G2 hve one CompactFlash Disk slot. (See Figure 1-2.)

Note Do not confuse the physical card slot name with the proper device name to use when addressing the card. Linear memory cards are addressed as the **slot0:** and **slot1:** devices. Flash Disk cards are inserted into the slot0 and slot1 physical slots but are addressed as the **disk0:** and **disk1:** devices. The CompactFlash Disk is inserted into the one slot on the NPE-G1 or NPE-G2 and is addressed as the **disk2:** device.

To install a Flash Disk or PC card in a PC card slot, complete the following steps.

Figure 1-1 Installing and Removing a PC Card or Flash Disk



Step 1 Attach an ESD wrist or ankle strap, connecting the equipment end of the strap to an unfinished chassis surface.

Step 2 Orient the Flash Disk or PC card so that its connector end faces the appropriate slot. (See a in Figure 1-1 or 1 in Figure 1-2.)

Step 3 Carefully insert the card into the slot until it completely seats in the connector, and the ejector button for the slot pops out toward you. (See b in Figure 1-1 or 2 in Figure 1-2.)

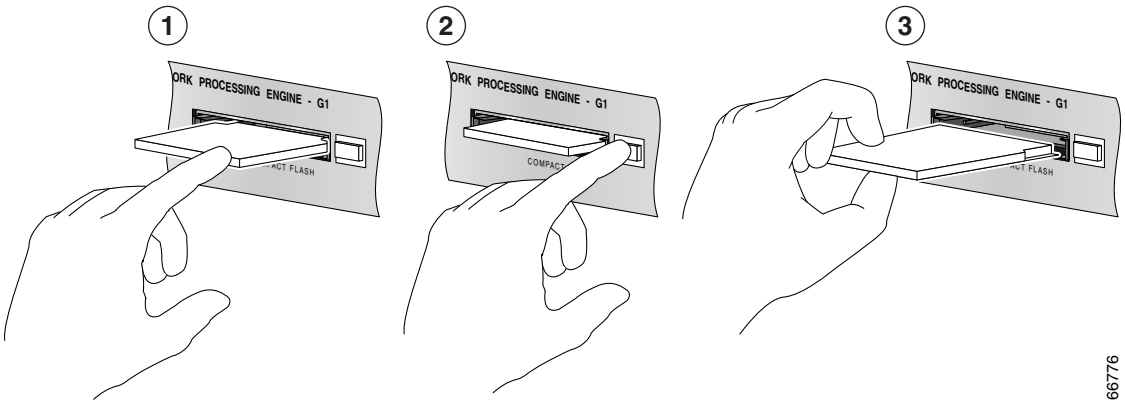
Tip The Flash Disk is keyed and cannot be seated the wrong way. The ejector button does not pop out if the Flash Disk is not completely inserted.

Note PC cards do not insert all the way into the PC card slots on the I/O controller; the end of the card protrudes from the I/O controller faceplate. Do *not* attempt to force the card past this point.

Some older PC cards might have foil tape attached to the outside edge of the card. If you insert one of these PC cards into the upper PC card slot (slot 1) of an I/O controller installed in a Cisco uBR7200 series router, it might be difficult to remove the card. You should use a new PC card that does not have the foil tape, remove the foil tape from the older PC card, or if necessary, use small pliers to remove the PC card.

This completes the procedure for installing a PC card in a PC card slot.

Figure 1-2 Installing and Removing a CompactFlash Disk



To remove and install a CompactFlash Disk from a CompactFlash Disk slot, complete the following steps:

Step 1 Press the ejector button on the slot.

Step 2 Grasp the card and pull it from the slot.

Step 3 Place the card in an antistatic bag.

Step 4 Insert the CompactFlash Disk into the CompactFlash Disk slot until it engages. It protrudes slightly.

Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card

Depending on the circumstances, you might need to use a Compact Flash Disk, Flash Disk, or PC card from another system to copy images or to back up configuration files; however, you cannot boot from a CompactFlash Disk, Flash Disk, or PC card that was formatted on another type of system. You must reformat the card before you can use it as a boot source.

The procedure for reformatting a CompactFlash Disk, Flash Disk, or PC card is similar. The major difference between them is selecting the correct device name for formatting.

Note To avoid potential problems when you insert CompactFlash Disks, Flash Disks, or PC cards in your router, we recommend that you reformat all of your CompactFlash Disks, Flash Disks, or PC cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the "Software and Hardware Requirements" section on page 3-2.)

Caution The following formatting procedure erases all information on the CompactFlash Disk, Flash Disk, or PC card. To prevent the loss of important data that might be stored on a CompactFlash Disk, Flash Disk, or PC card, proceed carefully. If you want to save the data on a CompactFlash Disk, Flash Disk, or PC card, copy the data to a server before you format the card.

The formatting procedure assumes the following:

- You have already booted your Cisco 7200 series router or Cisco uBR7200 series router.
- To be able to save the existing information on the CompactFlash Disk, Flash Disk, or PC card, you should have access to a TFTP server (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server or a secondary CompactFlash Disk, Flash Disk, or PC card.

  Note To ensure access to a TFTP server, you need to configure at least one network interface using the setup facility. Refer to the *Configuration Fundamentals Configuration Guide* publication for instructions on how to configure a network interface using the setup facility.

- If you do not have access to a TFTP server and want to save the existing information on the CompactFlash Disk, Flash Disk, or PC card, you have a second CompactFlash Disk, Flash Disk, or PC card that is already formatted with sufficient space on which to copy the files.
- You know the filename of the files you want to copy to the TFTP server or onto the secondary CompactFlash Disk, Flash Disk, or PC card.

Use the following procedure to reformat a CompactFlash Disk, Flash Disk, or PC (Flash memory) card:

Step 1 Insert the disk or card into slot 0. (If slot 0 is not available, use slot 1.) See the "Installing and Removing a CompactFlash Disk, Flash Disk, or Flash Memory Card" section on page 1-4.

Step 2 (Optional) Copy all the files on the CompactFlash Disk, Flash Disk, or PC card to a TFTP server or a secondary Flash Disk or PC card using the **copy** command. The appropriate device name depends on the type of memory card and the slot you are using. The CompactFlash Disk is inserted into the one slot on

the NPE-G1 or NPE-G2 and is addressed as the **disk2:** device. Flash Disks or PC cards are inserted into the slot0 and slot1 physical slots but are addressed as the **disk0:** and **disk1:** devices. PC cards are addressed as the **slot0:** and **slot1:** devices.

The following example is for copying files from a Flash Disk in physical slot0 (device name **disk0:**) to a TFTP server:

```
Router> enable
Password: <password>
Router# copy disk0:image.name tftp
Enter destination file name [image.name]: image.name
CCCC
```

Copying a Bootable Image onto a CompactFlash Disk, Flash Disk, or Flash Memory Card

After you have reformatted your CompactFlash Disk, Flash Disk, or PC (Flash memory) card, you can copy a bootable image onto it. The procedure for copying an image onto a CompactFlash Disk, Flash Disk, or PC card is based on the following assumptions:

- You have an I/O controller or NPE-G1 or NPE-G2 with a good image in the onboard Flash memory so you can start the router.
- The bootable image you want to copy to the Compact Flash Disk, Flash Disk, or PC card exists on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server.

Note To ensure access to a TFTP sever, you will need to configure at least one network interface using the setup facility. Refer to the *Configuration Fundamentals Configuration Guide* publication for instructions on how to configure a network interface using the setup facility.

- You know the filename of the image you want to copy onto the CompactFlash Disk, Flash Disk, or PC card.

Use the following procedure to copy a bootable file (called *new.imag*e in the examples) to the memory card:

Step 1 Boot the router and allow it to initialize.

Step 2 Insert a CompactFlash Disk, Flash Disk, or PC card into an available slot and reformat the disk or card using the procedure in the "Reformatting a CompactFlash Disk, Flash Disk, or Flash Memory Card" section on page 1-7. Then proceed to Step 3.

Note You cannot boot from a CompactFlash Disk, Flash Disk, or PC card that was formatted on another type of system. You must reformat the disk or card to use it as a boot source. To avoid potential problems when you insert a CompactFlash Disk, Flash Disk, or PC card in your router, we recommend that you reformat all of your CompactFlash Disks, Flash Disks, or PC cards using the recommended minimum Cisco IOS software release for your platform during your regularly scheduled service times. (See the "Software and Hardware Requirements" section on page 3-2, and Table 1-1, Table 1-2, and Table 1-3 in this chapter.)

Step 3 Use the following series of commands to copy the new image (*new.image* in the following example) to a PC card in slot0:

```
Router> enable
Password:
Router# copy tftp:new.image slot0:new.image
20575008 bytes available on device slot0, proceed? [confirm]
address or name of remote host [1.1.1.1]?
loading new.image from 1.1.1.1 (via Ethernet1/0):!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

```
[OK - 7799951/15599616 bytes]
CCCC
```

the PC card in slot 0, remove this card (place it in an antistatic bag and store it in a safe place), and insert the new PC card (with the *new.image* file) in slot 0. Proceed to Step 5 and use the **boot system flash slot0:new.image** command to designate the *new.image* file as the default boot helper image.

Step 1 Boot the router. By default, the *boot.image* file is used.

Step 2 Enable the router as follows:

```
Router> enable
Password:
Router#
```

Step 3 Insert the new Flash Disk or PC card in slot 1.

Step 4 Use the following command to copy the *new.image* file in slot 1 to the Flash Disk or PC card in slot 0, *only if* there is enough memory space for the two images to coexist. If there is not enough memory space, proceed to Step 5.

```
Router# copy slot1:new.image slot0:new.image
```

Note Use the **disk0:** and **disk1:** device names when using Flash Disks.

Step 5 Use the following series of commands to designate the *new.image* file (which is on the card in slot 0) as the default boot helper image and reboot the router:

```
Router# configure terminal
Router(config)# no boot system
Router(config)# boot system flash slot0:new.image
Router(config)# Ctrl-Z
Router# copy running-config startup-config
Router# reload
```

When the system reloads, it will boot the *new.image* file from the card in slot 0.

Working with a CompactFlash Disk, Flash Disk, or Flash Memory Card

This section provides basic instructions for working with a CompactFlash Disk, Flash Disk, or Flash memory card in your system. Detailed descriptions of more complex CompactFlash Disk, Flash Disk, or Flash memory card options and the Cisco IOS File System feature are beyond the scope of this publication and can be found in the following Cisco IOS Release 12.*x* publications:

- *Configuration Fundamentals Configuration Guide*, in the chapter "File Management"
- *Configuration Fundamentals Command Reference*, in the chapter "File Management Commands"

Software Command Overview

This section lists some of the basic software commands you can use with a CompactFlash Disk, Flash Disk, or PC card. Examples of these commands are included in the sections that follow.

The CompactFlash Disk, Flash Disk, or Flash memory cards, along with other locations in your system, are defined as *file systems*, which are locations where you can store, use, or retrieve files and software images. You can use a Flash Disk or Flash memory card in either one or both of the PC card slots in your I/O controller, and you can use a CompactFlash Disk in the one CompactFlash Disk slot on the NPE-G1 or NPE-G2.

The CompactFlash Disk inserted into the CompactFlash Disk slot in the NPE-G1 or NPE-G2 is referred to as the *disk2:* device. Flash Disks or PC cards inserted into slot0 and slot1 are referred to as the *slot0:* and *slot1:* devices, respectively.

The following partial output of the **show file systems** command shows a sample system with a Flash Disk—called *disk0:*—installed in PC card slot 0 and a linear Flash memory card—called *slot1:*—installed in PC card slot 1:

```
Router# show file systems

File Systems:

     Size(b)     Free(b)      Type  Flags  Prefixes
    32768000    29093816     flash     rw   bootflash:
           -           -     flash     rw   slot0: flash:
     7995392     4717276     flash     rw   slot1:
    48755200    48747008     flash     rw   disk0:
           -           -      disk     rw   disk1:
           -           -    opaque     rw   system:
           -           -    opaque     rw   null:
           -           -   network     rw   tftp:
      522232      505412     nvram     rw   nvram:
           -           -   network     rw   rcp:
           -           -   network     rw   ftp:
```

Note The **show file systems** command displays all recognized file systems, even if they are not currently in use. This is why the above display shows entries for both slot0: and disk1:, even though those devices are not currently inserted into the PC card slots.

Table 1-4 lists the software commands, along with their most common command options, that you can use with the Flash memory cards.

The following device names can be used with most of these commands:

- **disk2:** (CompactFlash Disk)
- **disk0:** and **disk1:** (Flash Disks)
- **slot0:** and **slot1:** (linear PC cards)
- **bootflash:** (onboard Flash memory)
- **nvram:** (onboard nonvolatile random-access memory)
- **running-config** (the running system configuration file)
- **startup-config** (the startup system configuration file)
- **tftp:** (a TFTP server to which you have access)

Table 1-4 Flash Disk-Related Software Commands

Command and Arguments	Purpose
cd [*dev:*]*directory-name*[1]	Changes current directory. Allows you to move between directories on a file system, where *directory-name* is the directory to which you want to move.
copy [*dev:*]*source-filename* [*dev:*]*destination-filename*	Copies from one file to another. Allows you to make a copy of a file (*source-filename*) located on a source file system (*dev:*) and place it with either the same filename or a different filename (*destination-filename*) on a destination file system.
delete [*dev:*]*filename*	Deletes a file. Allows you to delete any file you designate, where *filename* designates the name of the file.
dir [**/all** | *dev:*]	Lists files on a file system. Allows you to list the contents of the Flash Disks in PC Card slots 0 and 1. The **/all** argument lists all files on all file systems in your system.
format [**flash:** | **bootflash:** | *dev:*]	Formats a file system. Allows you to format a linear Flash memory card (**flash:**), onboard Flash memory (**bootflash:**), Flash Disk (**disk0:** or **disk1:**), or Compact Flash Disk (**disk2:**). This command also allows you to reformat a linear Flash memory card or Flash Disk that was formatted on another type of system. **Note** This command destroys all data currently in Flash memory; therefore, we strongly recommend that you use the **format** command with caution to prevent irretrievable loss of data.
mkdir [*dev:*]*directory-name*[1]	Creates a new directory. Allows you to create directories on a Flash Disk, where *directory-name* is the name you assign to this directory.
pwd[1]	Displays current working directory. Allows you to display the name of the Flash Disk directory in which you are currently working.
rename [*dev:*]*filename* [*dev:*]*filename*	Renames a file. Allows you to rename a file that is located on one Flash Disk and assign to that file another (or the same) file system path and filename. The first group of arguments defines the source (current) file system path and filename, and the second set of arguments defines the destination file system path and filename.
rmdir [*dev:*]*directory-name*[1]	Removes an existing directory. Allows you to remove a directory that currently exists on a Flash Disk, where *directory-name* is the name of the directory you want to remove.
show [*dev:*]	Lists information about Flash Disk format and geometry.
show file systems	Displays a list of all defined file systems.

1. This command does not work with a PC Card.

Tip For complete command information, see the "File Management Commands" chapter in the *Configuration Fundamentals Command Reference* document.

Using Software Commands

This section provides examples of some of the basic software commands you can use with the CompactFlash Disk, Flash Disk, or Flash memory cards.

- Using the show Command, page 1-14
- Using the pwd Command, page 1-15
- Using the cd Command, page 1-15
- Using the dir Command, page 1-15
- Using the format Command, page 1-16
- Using the copy Command, page 1-17
- Using the mkdir Command, page 1-18
- Using the rmdir Command, page 1-18
- Using the delete Command, page 1-18

Using the show Command

To display information about the CompactFlash Disk, Flash Disk, or Flash memory card format and geometry, use the **show** [*dev:*] command:

```
System# show disk0:
******** ATA Flash Card Geometry/Format Info ********

ATA CARD GEOMETRY
   Number of Heads:       16
   Number of Cylinders    840
   Sectors per Cylinder   32
   Sector Size            512
   Total Sectors          430080

ATA CARD FORMAT
   Number of FAT Sectors  105
   Sectors Per Cluster    16
   Number of Clusters     26822
   Number of Data Sectors 429536
   Base Root Sector       338
   Base FAT Sector        128
   Base Data Sector       370

Router#
```

In this example:

- Number of Heads is the number of heads on the Flash Disk.
- Number of Cylinders is the number of cylinders on the Flash Disk.
- Sectors per Cylinder is the number of sectors in each cylinder.
- Sector Size is the number of bytes in each sector.

- Total Sectors is the total number of sectors on the Flash Disk.
- Number of FAT Sectors is the number of sectors used to track allocation of clusters to files.
- Sectors Per Cluster is the number of sectors contained in each cluster. (Files grow by a minimum of one cluster.)
- Number of Clusters is the total number of clusters available for use by files.
- Number of Data Sectors is the number of sectors available for files.
- Base Root Sector is the logical address of the first sector of the root directory.
- Base FAT Sector is the first sector in the File Allocation Table (FAT).
- Base Data Sector is the first sector available for use by files.

Using the pwd Command

To determine which CompactFlash Disk or Flash Disk slot you are accessing, use the **pwd** command:

```
System# pwd
disk0:/
System#
```

The preceding example indicates that you are currently in the working directory called *disk0:*, which is the Flash Disk in PC Card slot 0.

Using the cd Command

To move back and forth between installed Flash Disks, use the **cd** command by defining a specific path name. Then to verify your working directory, use the **pwd** command:

```
System# cd disk1:
System# pwd
disk1:/
System# cd disk0:
System# pwd
disk0:/
```

You can also move up (or back) one level in the directory hierarchy using the **cd ..** command, and then verify your working directory with the **pwd** command:

```
System# pwd
disk1:daily_dir/
System# cd ..
System# pwd
disk1:/
System#
```

Using the dir Command

To list the directory structure and contents of the CompactFlash Disk, Flash Disk, or PC card from which you are currently working, use the **dir** command with no arguments:

```
System# dir
Directory of disk1:/

  1 drw-           0   Jul 25 1998 10:23:11  daily_dir
  2 drw-           0   Jul 25 1998 10:28:37  access_lists

48755200 bytes total (48742912 bytes free)
```

```
System#
```

Note that the size of the CompactFlash Disk, Flash Disk, or PC card is shown in the output of the **dir** command. (A 48-MB Flash Disk is shown in this example.) You can also view the contents of other directories and file systems using specific optional arguments with the **dir** command. (See Table 1-4.)

Using the format Command

To format a new CompactFlash Disk, Flash Disk, or PC card, use the **format** [*dev:*] command.

Note You must format a new CompactFlash Disk, Flash Disk, or PC card before you can use it. Flash memory cards or Flash Disks shipped with I/O controllers or CompactFlash Disks shipped with the the NPE-G1 or NPE-G2 are formatted at the factory. Spare Flash memory cards are blank and must be formatted before you can use them.

Caution The formatting procedure erases all information on the Flash Disk. To prevent the loss of important data that might be stored on a Flash Disk, proceed carefully. If you want to save data that is currently on your Flash Disk, copy the data to a TFTP server or to another Flash Disk *before* you format the new Flash Disk. A Flash Disk that was shipped as part of a configured system contains a Flash Disk-compatible Cisco IOS software image; therefore, you do not need to format it to use it in the system in which it was shipped.

Use the following procedure to format a new CompactFlash Disk, Flash Disk, or PC card using the **format** command. (The procedure assumes you have already booted your system.)

Step 1 Insert the Flash memory card into the appropriate PC card slot.

Step 2 Use the **format** *dev:* command to format the CompactFlash Disk, Flash Disk, or PC card. Use the **disk2**:device name for a CompactFlash Disk, **disk0:** and **disk1:** device names for Flash Disks, and **slot0:** and **slot1:** device names for linear PC cards. The following example shows a 48–MB Flash Disk in slot0 being formatted:

```
System# format disk0:
Format operation may take a while. Continue? [confirm]
Format operation will destroy all data in 'disk0:'.  Continue? [confirm]
Format:Drive communication & 1st Sector Write OK...
Writing Monlib
sectors.....................................................................
.....................
Monlib write complete

Format:All system sectors written. OK...

Format:Total sectors in formatted partition:81760
Format:Total bytes in formatted partition:49861120
Format:Operation completed successfully.

Format of disk0:complete
```

The new CompactFlash Disk, Flash Disk, or PC card is now formatted and ready to use in the system on which you formatted it.

Using the copy Command

To copy an image from a CompactFlash Disk, Flash Disk, or PC card to another file system or from another file system to the Flash Disk, use the **copy** command:

copy [*dev:*]*source-filename* [*dev:*]*destination-filename*

In this example:

- The file you want to copy is located in a file system (**tftp:**, **bootflash:**, **slot0:**, **disk1:**, and so forth).
- The variable *source-filename* is the name of the file you want to copy to another file system (**tftp:**, **bootflash:**, **slot0:**, **disk1:**, and so forth).
- The variable *destination-filename* is the name you want to apply to this file after it is copied. This can be the same name as the original filename or a different filename.

The following assumptions are made for this command:

- You have a system processor with a Flash Disk-compatible Cisco IOS software image in the onboard Flash memory—called *boot flash memory*—so you can start the system.
- Your system is running Cisco IOS Release 12.0(2) or later.
- The bootable image you want to copy to the CompactFlash Disk, Flash Disk, or PC card exists in another file system or on a TFTP server to which you have access (meaning you know its name and have connectivity to it), and at least one interface is available over which you can access this server through Telnet. To ensure access to a TFTP server, you need to configure at least one interface. To configure an interface, you can use the **setup** command or use the configuration editor.

  An Ethernet interface is used in the examples that follow.
- You know the filename of the image you want to copy to the CompactFlash Disk, Flash Disk, or PC card.

Note You might need to copy a new image to a CompactFlash Disk, Flash Disk, or PC Card whenever a new Cisco IOS software release or a new Cisco IOS software maintenance release becomes available. You can use the **copy** command for this purpose.

Use the following procedure to copy a file (called *new.image* in this example) located on a Flash Disk—called *disk1*:—in PC card slot 1 to the Flash Disk—called *disk0*:—in PC card slot 0:

Step 1 If the CompactFlash Disk, Flash Disk, or PC card is unformatted or has been formatted on another, possibly incompatible system, format it now using the procedure in the "Using the format Command" section on page 1-16, as appropriate.

Step 2 To copy the image *new.image* to Flash Disk *disk0:*, use the following series of commands:

```
System> enable
Password:
System# copy disk1:new.image disk0:new.image
3393 bytes copied in 0.548 secs#
System#
```

In the preceding example, the 3393-byte file *new.image* was copied to the Flash Disk in PC card slot 0 in approximately one-half second.

Step 3 Verify that the file *new.image* is now on the Flash Disk in PC card slot 0:

```
System# pwd
disk0:/
System# dir
Directory of disk0:/

  1  -rw-        3393   Jul 26 1998 17:44:47 new.image

48755200 bytes total (48747008 bytes free)
```

Using the mkdir Command

To create a directory on a CompactFlash Disk or Flash Disk, use the **mkdir** command. The following example shows how to create a directory called *daily_dir* on the Flash Disk in PC card slot 1, and then verify that it was created:

```
System# mkdir disk1:daily_dir
Created dir disk1:daily_dir
System# dir
Directory of disk1:/

  1  drw-           0   Jul 25 1998 10:15:43  daily_dir

48755200 bytes total (48751104 bytes free)
```

Note If you create a directory and place a file in it that you plan to access or use later on, be sure to define the entire directory path to the file as you enter the appropriate software commands.

For example, if you placed the file *itsa.file* into the directory *daily_dir* on a Flash Disk in slot 1, you must designate the entire directory path as follows: *disk1:daily_dir/itsa.file*. Otherwise, the system might not be able to locate this file.

Using the rmdir Command

To remove a directory from a CompactFlash Disk or Flash Disk, use the **rmdir** command. The following example shows how to remove the directory *daily_dir* from the Flash Disk in PC Card slot 1, and then verify that it was removed:

```
System# rmdir disk1:daily_dir
Delete disk1:daily_dir? [confirm] y
Removed dir disk1:daily_dir
System# dir
Directory of disk1:/

  No files in directory.

48755200 bytes total (48751104 bytes free)
```

Using the delete Command

To delete a file from a CompactFlash Disk, Flash Disk, or PC card, use the **delete** command. Use the **dir** command to find the file you want to delete, and then use the **delete** command to delete it.

The following example shows how to find a file (called *fun1)* on the Flash Disk in PC card slot 0, delete the file, and then verify that it is deleted:

Step 1 Find the file you want to delete:

```
System# dir
Directory of disk0:/

  1  drw-           0   May 10 1998 09:54:53 fun1

48755200 bytes total (48742912 bytes free)
```

Step 2 Delete the file *fun1*:

```
System# delete disk0:fun1
```

Step 3 Verify that the file *fun1* is deleted:

```
System# dir
Directory of disk0:/

  No files in directory.

48755200 bytes total (48742912 bytes free)
System#
```

Enabling Booting from a CompactFlash Disk, Flash Disk, or PC Card

To enable booting from a Flash memory card, set configuration register bits 3, 2, 1, and 0 to a value between 2 and 15 in conjunction with the **boot system** [*dev:*]*filename* configuration command. The following are definitions of the various Flash Disk-related **boot** commands:

- **boot system flash disk0:** or **boot system slot0:**—Boots the first file on the card in slot 0.
- **boot system flash disk1:** or **boot system slot1:**—Boots the first file on the card in slot 1.
- **boot system flash disk0:***herfile* or **boot system slot0:***herfile*—Boots the file named *herfile* on the card in slot 0.
- **boot system flash disk1:***hisfile* or **boot system slot1:***hisfile*—Boots the file named *hisfile* on the card in slot 1.

Note As you enter **boot** commands, pay attention to how you use the Spacebar, which influences the way your system interprets the commands. Also, ensure that you define the entire path to a file as you enter the **boot** commands; otherwise, the system might not be able to find the file.

For example, notice the difference in the following correct and incorrect commands:

```
System(config)# boot flash system disk0:myfile
```

Based on the preceding correct command, the system boots the file specified (*myfile*).

```
System(config)# boot flash system disk0: myfile
```

Based on the preceding incorrect command, the system finds the *filename* field blank because there is a space after the **disk0:** name. In this case, the system ignores the filename argument and boots the first file on the Flash Disk, which might not be the file called *myfile*.

Use the following procedure to enable booting the file *myfile* from a Flash memory card:

Step 1 Enter configuration mode and specify an image filename in the PC card slot from which to boot by using the **configure terminal** command, as follows:

```
System# configure terminal
Enter configuration commands, one per line. End with CTRL-Z.
System(config)# boot system flash disk0:myfile
```

Note Specify **disk2:** for a CompactFlash Disk on the NPE-G1 or NPE-G2.

Step 2 Enable the **boot system flash disk0:***myfile* command using the **config-register** command with the hexadecimal value shown in the following example:

```
System(config)# config-reg 0x2102
```

This command, with the hexadecimal value 0x2102, results in the following:

- Enables the system to boot the default boot ROM software if the Flash Disk-based image fails to boot—hexadecimal value 0x2000
- Disables Break—hexadecimal value 0x0100
- Enables the image *myfile* as the default boot image—hexadecimal value 0x0002

Step 3 Press **Ctrl-Z** to exit configuration mode:

```
System(config)#
Crtl-Z
System#
```

Step 4 Save the new configuration to NVRAM by using the **copy system:running-config nvram:startup-config** command as follows:

```
System# copy system:running-config nvram:startup-config
```

Making a CompactFlash Disk or Flash Disk-Based Software Image the Bootable Software Image

After you copy a software image to the Flash Disk, use the following series of commands to make the image bootable (the file named *new.image* in this example). The software image in this example is located on the Flash Disk in PC card slot 0. Note that the **config-register** command is also a part of this command sequence because you must set the configuration register to 0x2102 to enable loading an image from the Flash Disk.

```
System# config terminal
System(config)# no boot system
System(config)# boot system flash disk0:new.image
System(config)# config-register 0x2102
Ctrl-Z
System# copy system:running-config nvram:startup-config
System# reload
```

When the system reloads, it boots the image *new.image* from the Flash Disk in slot 0.